

TROPICAL CYCLONES AS BIOCLIMATIC ACTIVATORS: Part III

By J. GENTILLI, Nedlands

(Continued from p. 117)

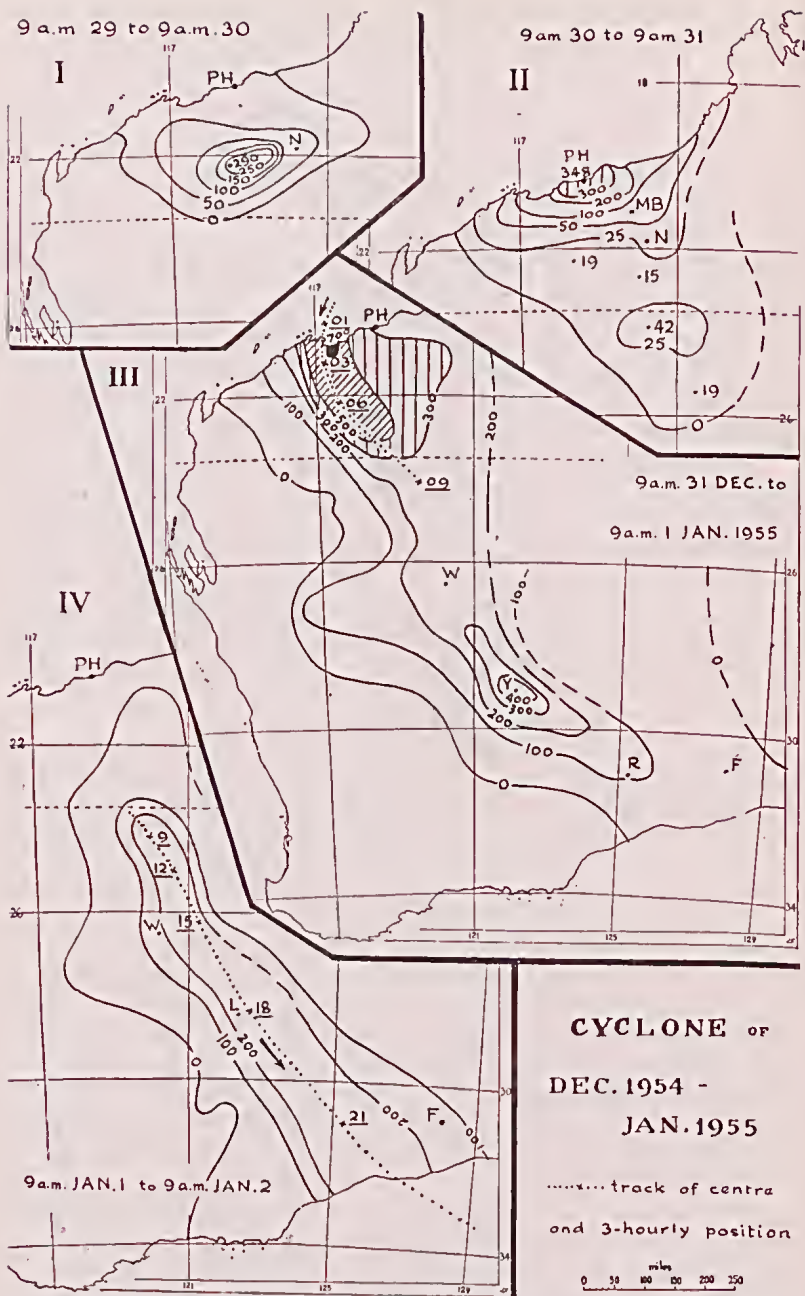
THE TROPICAL CYCLONE OF DECEMBER 29, 1954, TO JANUARY 2, 1955

This was a perfect example of a well-developed cyclone which could affect the mainland for some four or five days, while crossing the whole distance from Port Hedland to Eucla in less than 24 hours, following the most common path, and leaving a trail of disrupted communications, with some of the worst damage in the last 30 years. This cyclone's contribution to the spread of moisture was remarkable, as the series of maps shows.

The cyclone was still a long way from Australia, north-west of Broome, when its first rains hit the mainland, on the night of Wednesday, December 29. The heaviest falls were not in the Kimberleys but farther south: Mulga Downs, in the Fortescue, had 290 points in 24 hours, Bamboo Springs, in the De Grey, 251, and Wittenoom Gorge, also in the Fortescue, 158. Port Hedland had only 50 points. As the map shows, the heavy falls of rain occurred along the windward slopes of the Hamersley Plateau, and not along the coast. The Kimberleys received only a few points, the heaviest recorded fall being at Calwinyardah with 59 points.

On December 30 the cyclone was nearer to the coast, and the rainfall had become a little more widespread. Port Hedland received 348 points, Pippingarra 314, Mardie 289, Carlindi 221. Wittenoom Gorge was left on the fringe of the area of heavy rains, and received 19 points during that day. At 9 a.m. on December 31 the centre of the cyclone was about 100 miles north-west of Roebourne, and rains were heavy and widespread. Between 9 a.m. and 3 p.m. Port Hedland received 102 points. By the evening the cyclone had moved to within 50 miles west-north-west of Roebourne, travelling south at some 15 miles per hour. Extremely strong winds were experienced at Roebourne between 10 and 11.30 p.m., then there was about an hour's calm while the centre of the cyclone passed over. By 12.30 a.m. the wind had started to blow from the west, and a gust attained about 100 miles per hour. The total rainfall in about seven hours was 708 points. Wittenoom Gorge, also hit by extremely strong winds, recorded 545 points.

Meekatharra received plentiful rains for the first time in four years, with 183 points between 9 a.m. on December 31 and 9 a.m. on January 1. During the day the cyclone was slowly moving inland, and Mundiwindi, which it reached at about 9 a.m. on January 1, received 274 points in the preceding 24 hours, and some 200 more during January 1. Some spectacular falls occurred well ahead of the cyclone; when the centre of it was still well north of the Tropic,



Map 5. TROPICAL CYCLONE OF DECEMBER, 1954 - JANUARY, 1955. (See footnote, opposite, for detailed explanation.)

localities in the Eastern Goldfields were deluged. Yundamindera received 400 points, Murrin Murrin 396, Laverton 337, Leonora 325, Sandstone 176. Places which usually receive scanty winter rains got some of the heaviest tropical downpours: Rawlinna received 372 points and Forrest 126.

During the following 24 hours (ending at 9 a.m. on January 2) rain fell mostly south of the tropic. The cyclone gradually accelerated and crossed the southern shore between 10 and 11 p.m. on January 1, after releasing 218 points of rain over Mundiwindi, 191 over Wiluna (and only 14 over Meckatharra), 327 over Earraheedy, 328 over Laverton (and only 73 over Leonora), 28 over Kalgoorlie, 288 over Rawlinna and 104 over Forrest.

By the morning of January 2 the cyclone had become an ordinary frontal depression, travelling eastwards in the Great Australian Bight, causing strong northerly winds over south-eastern Australia, followed by a cold front with light rains, which continued until January 4.

TABLE V
AMOUNT AND AREA OF RAINFALL OF NEW YEAR, 1955, CYCLONE

Rainfall Points	I day sq. miles	II day sq. miles	III day sq. miles	IV day sq. miles
0-25	37,000	97,000	—	—
25-50	—	30,000	276,000	160,500
50-100	17,500	13,000	—	—
100-200	6,500	6,900	86,500	51,200
200-300	2,400	3,000	74,200	70,600
300-500	—	2,800	27,500	—
500-700	—	—	14,000	—
700-	—	—	300	—
Total	63,400	152,700	478,500	282,300
Average inches	0.60	0.39	1.36	1.18
Total acre/feet	1,998,100	3,180,000	34,354,600	17,680,800

The total quantity of water dropped on the mainland was therefore about 57,213,500 acre/feet.

THE TROPICAL CYCLONE OF FEBRUARY-MARCH, 1956

This cyclone is the only one recorded in Western Australia as having described a loop in its course. There have been cyclones which pursued irregular courses, the most remarkable being that of January, 1903, which travelled southwestwards from January 10 to 12, then veered eastwards and northeastwards on January 13 and 14, resuming a normal trajectory on January 16. The cyclone of April, 1920, (shown by a dotted line on the inset map) came from the ocean, cut the coastline more or less perpendicularly near Wallal, and then veered sharply to the right and disappeared over the sea in the opposite direction, only some 100 miles from Wallal.

The map is divided into four sections, each giving the rainfall (in points) for a successive day of the cyclone's life. Heavy rainfall is received well ahead of the cyclone, as shown by insets I and II. The cyclone's centre followed the path shown by the dotted line in III and IV, with the hour of the day shown by the upright figures, underlined. Localities are shown by their initials—Port Hedland, Marble Bar, Nullagine, Wiluna, Laverton, Yundamindera, Rawlinna, Forrest.

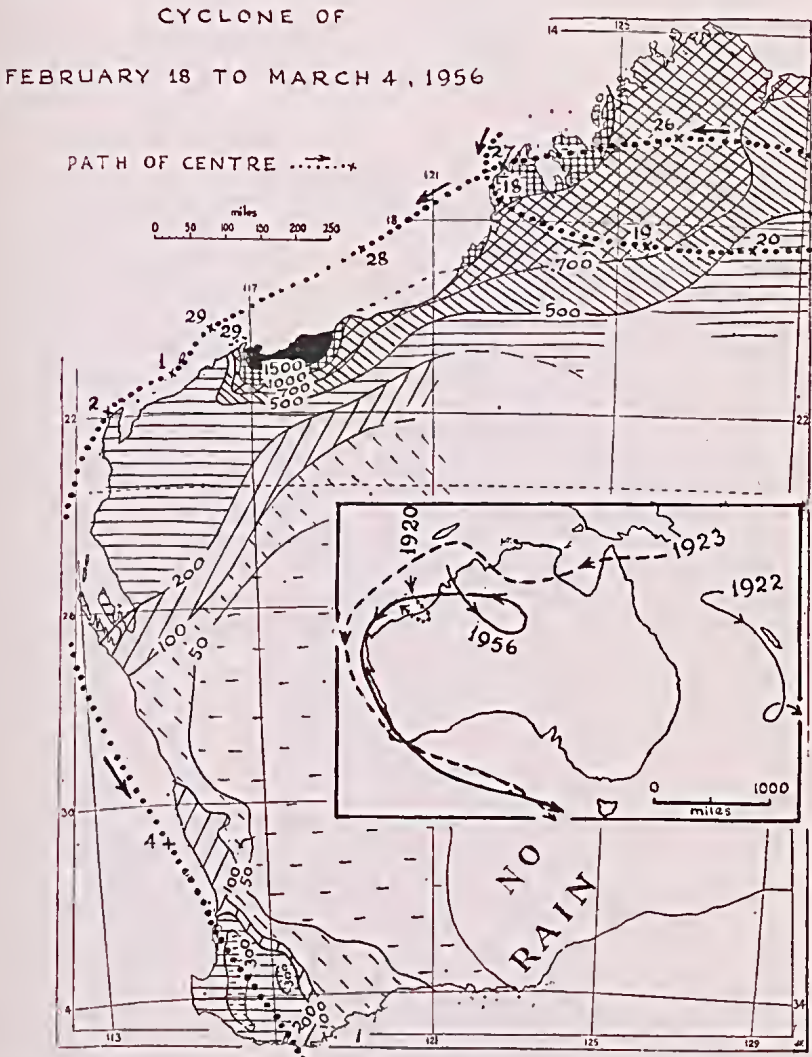
Several of the Queensland eyelones show similar irregularities, and the eyelone of January, 1922 (see inset), which went as far as New Zealand, made a distinct loop to the right (i.e., eyelonically) between latitudes 27° and 30° S. Tannehill (1952) discusses the tracks of the eyelones of October, 1910, and September, 1943, in the Caribbean area. These eyelones described a definite loop to the left, i.e., also cyclonically. Tannehill quotes expert opinion to the effect that a eyelone cannot describe a loop to the right (i.e., anticyelonically) because of the impossibility of having suitable barometric situations.

A loop to the left in the Northern Hemisphere corresponds to one to the right in the Southern Hemisphere, both being eyelonic in their sense of deviation. Thus there is no difference between the tracks quoted by Tannehill for the Caribbean region and the Gulf of Mexico, and the track recorded north of New Zealand in 1922. The anomaly occurs in the case of the Western Australian eyelone of February-March, 1956 (see map) because this eyelone described a large loop to the left, i.e., anticyelonically. The only other example known to the writer of a tropical eyelone which describes a loop anticyelonically is that of the typhoon of November, 1926, which began east of the Palaus and described a large loop before passing very close to Manila (Bruzon and Carton, 1930).

The Western Australian eyelone described a loop with a longer axis of over 800 miles and a shorter axis of about 200 miles. The Palau-Manila typhoon of 1926 is shown by Bruzon and Carton as having described a loop with a longer axis of about 220 miles and a shorter axis of about 140. The Western Australian cyclone took 10 days to describe its loop, whereas the Caribbean hurricanes mentioned by Tannehill described their loops in three days each, and the New Zealand eyelone of 1923 described its loop in two days only.

Until 1956 the longest cyclonic tracks in low latitudes over Australia were those followed by the eyelones of January 18 and February 18, 1923, which began in the Coral Sea and crossed the entire width of Northern Australia before recurving and skirting the whole length of the Western Australian coast, some 3,000 to 3,500 miles in all. If the track followed as a frontal eyelone is added to the track of the tropical cyclone proper, the eyelone of February 18, 1923, may have held a remarkable record, because it went very nearly as far as Tasmania before being lost sight of, covering some 4,700 miles in 14 days (see broken line on inset map). The track of the tropical eyelone of February-March, 1956, extended for 3,700 miles from its unknown inception off King Sound to its exit west of Albany 16 days later. It was still clearly recognizable as a frontal cyclone on the weather charts for March 5 and 6, thus adding some 1,000 more miles to its original track, and reaching the same exceptional track length of 4,700 miles (see inset map). It certainly covered the longest distance over Western Australian territory of any eyelone on record.

Because of the fact that so much of the track was over the ocean, the amount of precipitation brought by this cyclone, although remarkable, is not outstanding.



Map 6. TROPICAL CYCLONE OF FEBRUARY-MARCH, 1956.

The main map shows the path of the cyclone's centre over Western Australia (dotted line) with the respective dates, and the total rainfall brought by the cyclone (in points). Notice the considerable loss of travelling speed from February 29 to March 2. The inset shows the most notable paths of tropical cyclones in the Australian zone. Notice the difference in the location of the loop of the 1956 cyclone on the main map and the inset; the main map is drawn from Press reports, the inset from published weather maps.

TABLE VI
RAINFALL BROUGHT BY THE FEBRUARY-MARCH, 1956, CYCLONE

Rainfall Points	Area sq. miles	Rainfall Points	Area sq. miles
1- 50	226,000	1000-1500	11,600
50- 100	130,200	1500-	2,800
100- 200	58,200		
200- 500	133,000	Total in W.A.	666,800
500- 700	49,000	In N.T. (very approx.)	75,000
700-1000	56,000		
			741,800

The total amount of water brought to Western Australia was some 87,410,250 acre/feet, or an average of 2.47 inches over the whole 666,800 square miles. If one adds a conservative estimate of 12,000,000 acre/feet dropped over the Northern Territory, one obtains a total precipitation of nearly 99,500,000 acre/feet.

The cyclone was first noticed on February 18, when it crossed the coast near Broome late in the day. There was a centre of low pressure near Broome on February 16, but this centre was stationary and did not last long. The cyclone approached from the north-west, and moved rapidly towards the south-east, weakening in the process. At this stage it could have worked its way along the trough of relatively low pressure (998-1002 millibars) which extended from Broome to Eucla, between two anticyclones situated west of Cape Leeuwin and east of Tasmania respectively. By February 20, however, the two anticyclones had coalesced and the former western one had moved so rapidly that it lay due south of the cyclone, thus blocking its southward progress. The composite anticyclone was too small and its pressure too low (1004-1008 millibars) to fill the low caused by the cyclone, as so often happens under similar conditions.

By February 22 the cyclone had become almost stationary over central Australia. Some time between February 22 and 23 it could have moved southwards along the trough of low pressure formed between the anticyclone of February 20 and a new much more powerful anticyclone (1012-1014 millibars) which was advancing from the Indian Ocean, but by then it had been over three days almost stationary over a land surface and had lost much of its rotatory speed. The new anticyclone continued its eastward progress and by February 26 it had a pressure of over 1020 millibars at its centre, and was pushing the cyclone north-westwards back towards Broome. This is the most extraordinary stage in the development of this exceptional cyclone—its revival under meteorological conditions which normally lead to the filling-in and disappearance of most tropical cyclones. After February 27, when the cyclone had resumed its full rotatory speed and was poised between Broome and Cape Leveque, it was to be expected that the north-western coast would feel its full impact.

On February 28 it seemed possible that the cyclone would slide between the great anticyclone mentioned above, which had then moved beyond Tasmania, and a new anticyclone which appeared just off Cape Leeuwin. However, the new anticyclone

moved eastwards very fast, and on February 29 and March 1 held the cyclone stationary off Roebourne, making it impossible for it to follow the usual track across the North-West coast and through the Eastern Goldfields. During March 2 conditions were in the balance, but the cyclone had become more intense, with winds of 60 to 94 miles per hour, whereas the anticyclone was weakening and developing a trough across its middle, just off the South-West. This trough enabled the cyclone to work its way southwards along a path much farther west than usual and finally to join the westerly stream south of Australia.

CONCLUSION

The examples chosen show the following facts: (a) heavy rains occur well ahead of most cyclones; (b) the heaviest tropical-cyclonic rainfall is usually found north of the Hamersley block, and a peculiar pattern of drought prevails just immediately west, south and east of this area; (c) if a tropical cyclone breaks through the anticyclonic belt its travelling speed increases and the rainfall becomes much heavier again; (d) tropical-cyclonic rainfall is occasionally very important in the semi-arid country south of the Tropic, but it is so important north of the Tropic as to make averages utterly meaningless; (e) the tropical cyclone of February-March, 1956, had outstanding characteristics.

ACKNOWLEDGMENT

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FROM FIELD AND STUDY

White Ibis at Fremantle.—On January 7, 1956, my brother Waverney and I made our first acquaintance with the White Ibis (*Threskiornis aethiopica*), when a single bird was seen in the company of several Straw-necked Ibis at Bibra Lake, six miles east of Fremantle. The ibis were feeding along the eastern shore of the lake. We again observed the ibis on February 4.

—JULIAN R. FORD, Fremantle.

Wambenger (*Phascogale penicillata*) at Coolup.—On December 19, 1955, Mr. J. D. Cox of Coolup brought me a Wambenger which his cat had caught. He stated that this was the first specimen he had seen though he had lived at Arthgarven, Coolup, for 40 odd years and now farmed part of the original property. The farm is situated between the South-West Highway and the Murray River, about 5 miles south of Pinjarra. Most other old residents of the districts whom I have contacted have never noted the animal here, but T. M. Smith, of West Coolup, recalled seeing one about 15 years ago. J. D. Cox's specimen was a male; weight 5 $\frac{3}{4}$ oz.; testis, 7.3 x 5.3 mm.; stomach, practically empty but contained some small fragments of a gecko (*Phyllodactylus* sp.) and remains of at least two small insects, one a beetle.

—ANGUS ROBINSON, "Yanjettec," Coolup.

Crested Pigeon at Shackleton.—A Crested Pigeon (*Ocyphaps lophotes*) has appeared in this district, considerably south of its recorded range. The bird first appeared at a farm near Kokerbin Hill, 8 miles north-west of Shackleton. After a few weeks it disappeared and was next seen at our farm, which is 6 miles north-east of Shackleton on May 20, 1956. The stiff, erect crest, deep coral pink legs, and characteristic habit of cocking its tail on alighting positively identify the bird.